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TREASURY DEPARTMENT  
UNITED STATES PUBLIC HEALTH SERVICE

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THE RELATION OF PHYSICAL DEFECTS  
TO SICKNESS

A STUDY OF ABSENCE FROM SCHOOL ON ACCOUNT  
OF SICKNESS AMONG 3,786 CHILDREN IN FOUR  
LOCALITIES IN MISSOURI DURING THE  
SCHOOL SESSION 1920-1921

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## THE RELATION OF PHYSICAL DEFECTS TO SICKNESS.

A STUDY OF ABSENCE FROM SCHOOL ON ACCOUNT OF SICKNESS AMONG 3,786 CHILDREN IN FOUR LOCALITIES IN MISSOURI DURING THE SCHOOL SESSION 1920-21.<sup>1</sup>

By SELWYN D. COLLINS, Assistant Statistician, United States Public Health Service.

A number of studies of morbidity among observed groups of people have been published in the past few years. These studies have shown that disability from sickness varies with sex and age, and the few studies which show disability by occupation show considerable variation as between occupations. A previous study<sup>2</sup> based on the observation of sickness among children during the school session 1919-20, showed disability among children of different sex and age, regardless of the presence or absence of physical defects. It is the purpose of the present study to compare disability among children with certain common physical defects with disability among children with no physical defects, as measured by absence from school on account of sickness.

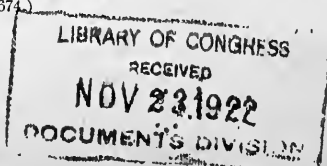
In the course of a survey made in Missouri, school children were examined for physical defects, and certain physical measurements were made of them. On the same card on which the results of the examination were entered, the teacher kept a record of the absence of the child from school on account of sickness and from causes other than sickness. A group of 3,786 children from four fairly representative localities in Missouri were observed during the school session 1920-21, and the records tabulated for this study. The following table shows the four localities and the number of children observed in each.

TABLE I.—*Distribution according to locality of residence of 3,786 children in Missouri observed for sickness during the school session 1920-21.*

City.	County.	Population of city, 1920.	Number of children observed.
All localities.....			3,786
Hannibal.....	Marion.....	19,306	1,378
Moberly.....	Randolph.....	12,808	1,064
Warrensburg.....	Johnson.....	4,811	682
Joplin.....	Jasper.....	29,902	662

<sup>1</sup> From Field Investigations in Child Hygiene, United States Public Health Service, in cooperation with the Statistical Office, United States Public Health Service. Reprint from the Public Health Reports, vol. 37, No. 36, Sept. 8, 1922, pp. 2183-2193.

<sup>2</sup> Collins, Selwyn D.: Sickness among school children. Public Health Reports, vol. 36, No. 27, pp. 1549-1559, July 8, 1921. (Reprint 674.)



The children ranged in age from 5 to 20 years, but very few were under 6 or over 16. The following table shows the distribution of the observed children according to sex and age.

TABLE II.—*Distribution according to sex and age of 3,786 children in Missouri observed for sickness during the school session 1920-21.*

Age last birthday (years).	Number.			Per cent.		
	Both sexes.	Boys.	Girls.	Both sexes.	Boys.	Girls.
All ages.....	3,786	1,891	1,895	100.0	100.0	100.0
6 and under.....	430	218	212	11.4	11.5	11.2
7.....	418	200	218	11.0	10.6	11.5
8.....	420	209	211	11.1	11.1	11.1
9.....	478	239	239	12.6	12.6	12.6
10.....	427	229	198	11.3	12.1	10.4
11.....	428	205	222	11.3	10.9	11.7
12.....	414	201	213	10.9	10.6	11.2
13.....	375	183	192	9.9	9.7	10.1
14.....	235	126	109	6.2	6.7	5.8
15.....	114	62	52	3.0	3.3	2.7
16 and over.....	47	18	29	1.2	1.0	1.5

The data as reported by the teacher showed the total possible number of days the child could have attended school had he not been absent from some cause, the number of days on which the child was absent because of sickness, and the number of days absent from causes other than sickness. Sickness includes illness of any nature whatever. It is possible that some absence because of sickness may have been reported as due to causes other than sickness and that some absence from other causes may have been reported as due to sickness. It seems hardly probable, however, that the error was large enough to vitiate the results.

The record of the child's physical examination showed what physical defects he had. The results of the hearing tests were reported so incompletely and imperfectly that no account was taken of hearing in any case; but all other physical defects were considered. In tabulating the data, the children were divided into several classes according to physical condition. The following table shows the physical condition groups used, the number of children in each group, and the total days enrolled—that is, the total number of "child days" for which records were kept:

TABLE III.—*Distribution according to physical condition of 3,786 children (both sexes) in Missouri observed for sickness during the school session 1920-21.*

Physical condition.	Number of children with specified defects.	Total possible number of days of school attendance.
All physical conditions.....	3,786	611,279
Group I: No recorded defects.....	784	132,995
Group II: One or more decayed teeth only.....	545	83,259
Group III: Defective vision (with and without decayed teeth).....	389	57,382
Group IV: Children with and without decayed teeth or defective vision, but with no other recorded defects.....	2,283	372,755
Group V: Enlarged or diseased tonsils only (with and without decayed teeth or defective vision).....	717	115,037
Group VI: Adenoids alone or associated with other defects; enlarged or diseased tonsils associated with other defects; mouth breathing alone or associated with other defects; chronic nasal catarrh alone or associated with other defects (with and without decayed teeth or defective vision).....	571	90,783
Group VII: Defects other than those included in the above groups (with and without decayed teeth or defective vision).....	215	32,701

Table IV shows the distribution according to age of the children in each physical-condition group. This table is included to show the extent of the data in the various age and physical-condition groups as an index of the reliability of the results.

TABLE IV.—*Number of children (both sexes) and the aggregate number of school days during which they were under observation for sickness.*

Age.	Total.	Defect group. <sup>a</sup>						
		I	II	III	IV	V	VI	VII
NUMBER OF CHILDREN.								
All ages.....	3,786	784	545	389	2,283	717	571	215
6-7.....	848	137	94	87	499	154	151	44
8-9.....	898	190	144	77	534	189	131	44
10-11.....	855	181	113	77	502	172	133	48
12-13.....	789	168	130	89	482	140	116	51
14-16.....	396	108	64	59	266	62	40	28
TOTAL POSSIBLE NUMBER OF DAYS OF SCHOOL ATTENDANCE.								
All ages.....	611,279	132,995	83,259	57,382	372,755	115,037	90,783	32,704
6-7.....	137,482	23,693	14,018	12,128	81,925	25,026	23,940	6,591
8-9.....	144,831	32,905	21,489	10,909	87,381	30,163	20,420	6,876
10-11.....	139,310	31,116	17,216	12,058	83,364	27,007	21,467	7,472
12-13.....	127,856	28,139	20,590	13,404	78,166	23,131	18,785	7,774
14-16.....	61,800	17,142	9,946	8,883	41,919	9,710	6,171	4,000

<sup>a</sup> See Table III for definitions of the groups.

The data on hearing were too incomplete to use; therefore all groups include children with defective hearing as well as normal hearing.

Group I consists of children who had no recorded defects.

Group II consists of children who had one or more decayed teeth, but no other recorded defects.

Group III consists of children with defective vision with and without decayed teeth, but with no other defects.

The small number of children made it impossible to subdivide them into as definite and clear-cut groups as would be desirable for a complete analysis. It was, therefore, necessary to disregard both teeth and vision in making the following defect groups, in order to have sufficient numbers of children in the groups to give dependable results. The effect of decayed teeth or defective vision on absence from school did not seem to be great. Also, unless the defects of teeth or vision were associated in some way with the other defects considered there would be no greater proportion of children with decayed teeth or defective vision in one defect group than in another or in the group who had no general defects when teeth and vision were not taken into account. (Group IV.)

Group IV consists of children with and without decayed teeth or defective vision, but with no other recorded defects.

Group V consists of children with and without decayed teeth and defective vision who had enlarged or diseased tonsils, but no other recorded defects.

Group VI consists of children with and without decayed teeth and defective vision, but who had adenoids alone or associated with other defects; enlarged or diseased tonsils associated with other defects; mouth breathing alone or associated with other defects; chronic nasal catarrh alone or associated with other defects.

Group VII consists of all children with and without decayed teeth or defective vision and with defects other than those included in the above groups.

Since the children could not be divided into groups according to specific defects, but had to be sorted according to groups of defects, Table V is introduced to show the number of specific defects included in each of the groups who had defects other than decayed teeth or defective vision.

TABLE V.—*Number of children in each of the physical condition groups who had certain specific defects.*

Defect.	All physical conditions.		Number of defects in each group. <sup>a</sup>			
	Defects per 1,000 children.	Number of children.	IV.	V.	VI.	VII.
Total number of children.....	1,000.0	3,786	2,283	717	571	215
No general defects (teeth and vision not taken account of).....	603.0	2,283	2,283	.....	.....	.....
Mouth breathing.....	95.1	360	.....	.....	360	.....
Adenoids.....	48.9	185	.....	.....	185	.....
Chronic nasal catarrh.....	6.1	23	.....	.....	23	.....
Deflected septum or other nasal obstruction.....	4.2	16	.....	.....	16	.....
Enlarged tonsils or infected throat.....	274.2	1,038	.....	713	325	.....
Diseased or inflamed tonsils.....	20.3	77	.....	36	41	.....

<sup>a</sup> See Table III for definitions of the groups.

TABLE V.—*Number of children in each of the physical condition groups who had certain specific defects—Continued.*

Defect.	All physical conditions.		Number of defects in each group.			
	Defects per 1,000 children.	Number of children.	IV.	V.	VI.	VII.
Ear discharging.....	2.6	10	.....	.....	2	8
Ear drum perforated.....	.3	1	.....	.....	.....	1
Ear drum obscured by wax.....	3.4	13	.....	.....	10	3
Hyperopia.....	4.5	17	.....	.....	14	3
Astigmatism.....	2.3	1	.....	.....	1	.....
Strabismus.....	.1	.....	.....	.....	.....	4
Blepharitis.....	14.8	56	.....	.....	22	34
Conjunctivitis.....	9.8	37	.....	.....	23	14
Trachoma.....	2.9	11	.....	.....	7	4
Glandular enlargement, cervical.....	8.5	32	.....	.....	23	9
Simple goiter.....	3.7	14	.....	.....	9	5
Hernia.....	.8	3	.....	.....	1	2
Heart defects.....	3.4	13	.....	.....	9	4
Tuberculosis or pretubercular.....	.8	3	.....	.....	3	.....
Anemia.....	.5	2	.....	.....	2	.....
Winged scapulae.....	.3	1	.....	.....	.....	1
Spinal curvature.....	1.1	4	.....	.....	1	3
Deformity of hand or arm.....	1.3	5	.....	.....	2	3
Deformity of foot or leg.....	1.8	7	.....	.....	3	4
Paralysis, infantile.....	.5	2	.....	.....	.....	2
Retarded.....	.5	2	.....	.....	.....	2
Feeble minded or suspected.....	.8	3	.....	.....	2	1
Speech defect.....	10.8	41	.....	.....	20	21
Ringworm.....	.5	2	.....	.....	.....	2
Pediculosis.....	13.5	51	.....	.....	26	25
Impetigo.....	1.6	6	.....	.....	3	3
Scabies.....	2.1	8	.....	.....	4	4
Eczema.....	.3	1	.....	.....	.....	1
Skin defect (not otherwise specified).....	30.4	115	.....	.....	50	65
Orthopedic defect (not otherwise specified).....	.3	1	.....	.....	1	.....
Glandular enlargement (not otherwise specified).....	.3	1	.....	.....	1	.....
Ear defect (not otherwise specified).....	.3	1	.....	.....	1	.....
Eye defect (not otherwise specified).....	.5	2	.....	.....	.....	2
Miscellaneous.....	5.5	21	.....	.....	11	10

The children observed have now been classified into the various groups and the groups have been defined. The next step in the study is the comparison of the absence on account of sickness among the children in these various groups, that is, the comparison of the absence on account of sickness among children with no defects with absence among children with the various specified groups of physical defects. The following table (Table VI) shows, by sex, age, and physical condition, the percentage of the total school days which were lost on account of sickness and of causes other than sickness.<sup>3</sup>

Figures 1 and 2 compare graphically the time lost from sickness by children with various physical defects. Figure 1 compares the averages for all ages, and Figure 2 makes the comparison by age groups. Sickness in each case is not limited to sickness directly connected with the defect, but includes all illness from any cause whatever.

<sup>3</sup>If a child was permanently separated from school he was no longer counted as enrolled. In the case of absences for short periods, the total time absent was counted rather than drop the child from the roll and reenter him upon return, as is sometimes done in keeping school records. Obviously, the record desired was the total time absent because of sickness.



TABLE VI.—*Physical defects and absence from school on account of sickness.*

Percentage of the total school days which were lost by children with no defects compared with children with various physical defects.

[3,786 children in Missouri—School session 1920-21.]

Physical condition.	Age.					
	All ages.	6-7	8-9	10-11	12-13	14-16
BOTH SEXES.						
All physical conditions.....	3.5	4.9	3.5	3.0	2.9	2.3
Group I: No recorded defects.....	3.2	4.5	3.5	2.8	2.7	1.9
Group II: One or more decayed teeth only.....	3.3	4.7	3.5	2.7	3.0	2.3
Group III: Defective vision.....	3.5	3.3	3.5	3.8	3.8	2.8
Group IV: With and without defective teeth or vision but with no other defects.....	3.2	4.7	3.2	2.6	2.8	2.1
Groups V-VII: Defects of any kind.....	3.9	5.2	4.0	3.5	3.1	2.8
Group V: Enlarged or diseased tonsils only.....	3.6	4.5	3.9	3.4	2.9	2.5
Group VI: Adenoids alone and adenoids, tonsils, etc., associated with other defects.....	4.2	5.9	4.0	3.9	3.2	2.2
Groups V-VI: Adenoids, tonsils, etc., alone or associated with other defects.....	3.9	5.2	3.9	3.6	3.0	2.4
Group VII: All other defects.....	4.0	5.3	4.5	3.0	3.1	4.6
BOYS.						
All physical conditions.....	3.3	5.0	3.2	2.8	2.8	2.3
Group I: No recorded defects.....	3.2	4.4	3.5	3.2	2.9	1.7
Group II: One or more decayed teeth only.....	3.3	3.8	3.6	3.0	3.1	3.2
Group III: Defective vision.....	2.6	3.0	2.2	2.9	2.0	3.1
Group IV: With and without defective teeth or vision but with no other defects.....	3.1	4.7	3.0	2.6	2.5	2.2
Groups V-VII: Defects of any kind.....	3.7	5.4	3.5	3.2	3.2	2.4
Group V: Enlarged or diseased tonsils only.....	3.6	4.7	3.8	3.1	3.5	1.9
Group VI: Adenoids alone and adenoids, tonsils, etc., associated with other defects.....	3.8	5.7	3.3	3.5	2.9	2.2
Groups V-VI: Adenoids, tonsils, etc., alone or associated with other defects.....	3.7	5.3	3.5	3.3	3.2	2.1
Group VII: All other defects.....	3.9	6.4	3.5	2.3	3.2	4.3
GIRLS.						
All physical conditions.....	3.6	4.8	3.9	3.2	3.1	2.4
Group I: No recorded defects.....	3.1	4.7	3.5	2.5	2.6	2.2
Group II: One or more decayed teeth only.....	3.2	5.6	3.4	2.4	2.9	.8
Group III: Defective vision.....	4.1	3.5	4.4	4.2	5.1	2.6
Group IV: With and without defective teeth or vision but with no other defects.....	3.4	4.7	3.5	2.7	3.1	2.0
Groups V-VII: Defects of any kind.....	4.0	5.0	4.5	4.0	2.9	3.2
Group V: Enlarged or diseased tonsils only.....	3.6	4.4	3.9	3.6	2.4	3.0
Group VI: Adenoids alone and adenoids, tonsils, etc., associated with other defects.....	4.7	6.1	5.3	4.5	3.7	2.2
Groups V-VI: Adenoids, tonsils, etc., alone or associated with other defects.....	4.0	5.1	4.3	4.0	2.9	2.7
Group VII: All other defects.....	4.1	3.4	5.7	4.0	3.0	4.7

See Table III for detailed definitions of groups.

Figure 1 compares absence among children (all ages) with no defects with children with various groups of defects. Children with no defects were absent 3.2 per cent of the school days as against 3.9 per cent by children with defects of any kind. Considering these percentages as rates (days absent per 100 days enrolled), the rate of absence from sickness for children with defects is 22 per cent greater than the rate for children with no defects. The rate of absence from

sickness for children with enlarged or diseased tonsils is 12 per cent greater than the no-defect rate, and the rate for children with adenoids, defective tonsils, etc., associated with other defects, is 31 per cent greater than the rate for the children with no defects. The rate for children with defective vision was 9 per cent greater and the rate for children with decayed teeth was 3 per cent greater than the no-defect rate.

Figure 2 takes up the rates in the various age groups and shows what differences are consistent for the different ages. It shows for five age groups for both sexes combined the percentage of the total school

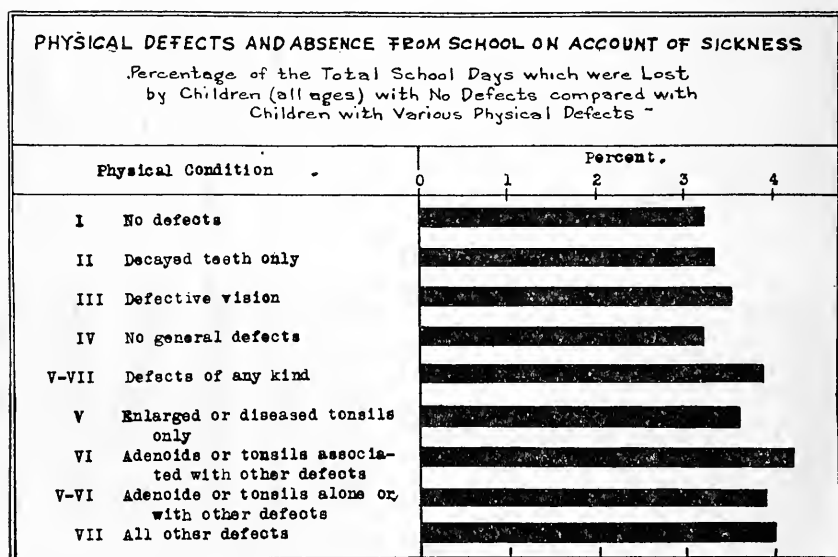


Fig. 1.

See Table III for detailed definitions of groups.

days which were lost on account of sickness by children in the various physical conditions. In each small graph in the figure, the curve of sickness for children with no physical defects (Group I) is repeated so that a comparison can more readily be made between this group and each of the other groups. Graph A compares children with no defects (Group I) with those who have some general physical defect (Groups V to VII inclusive). The differences are considerable and are consistent in the various age groups.

Graph B compares children with no defects with children who have decayed teeth and with children who have defective vision. In neither case are the differences consistent for the various age groups. Vision appears to have some influence; but with the few data available no very definite conclusion can be drawn unless the results are consistent for the various ages. It is possible that the effect of certain defects might be shown to be greater at certain ages than at others if there were sufficient data.

In the two lower graphs, the children with no defects (Group I), are compared with a group with enlarged or diseased tonsils or both (Group V), and with another group who have adenoids alone, or

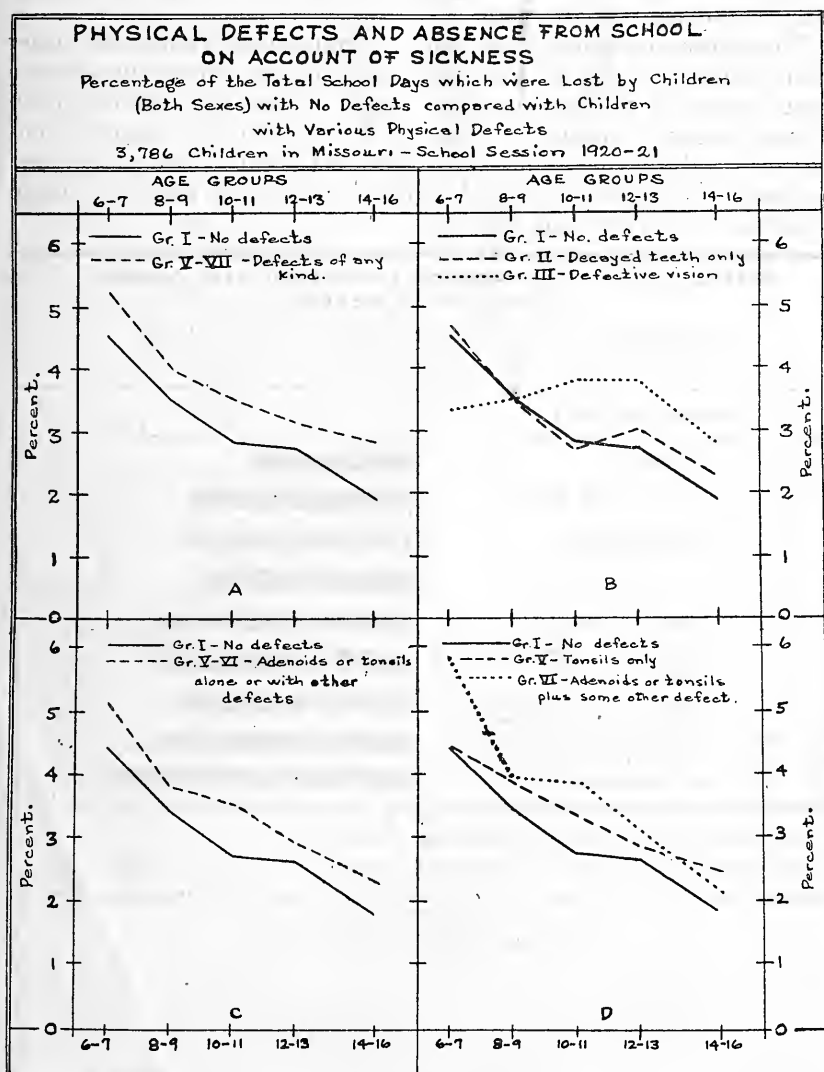


Fig. 2.

See Table III for detailed definitions of groups.

associated with other defects, defective tonsils associated with other defects, mouth breathing and chronic nasal catarrh alone or associated with other defects (Group VI). Graph D shows each group separately and graph C shows the two groups combined. The group with defective tonsils only (Group V) lost more time at every age group except 6-7 years than the group with no physical defects (Group I). The group with adenoids, defective tonsils, etc., asso-

ciated with other defects (Group VI) lost considerably more time at every age group than the no-defect group (Group I) and also more time than the group with defective tonsils only (Group V) in every age group except 14-16 years.

The records also showed the time lost from school from causes other than sickness. Table VII shows by sex and age groups the absence from causes other than sickness for each of the physical-condition groups used in tabulating the absence from sickness. Figure 3 compares, for all ages combined, the time lost from causes other than sickness, by children with no defects, with the time lost by children with the various physical defects.

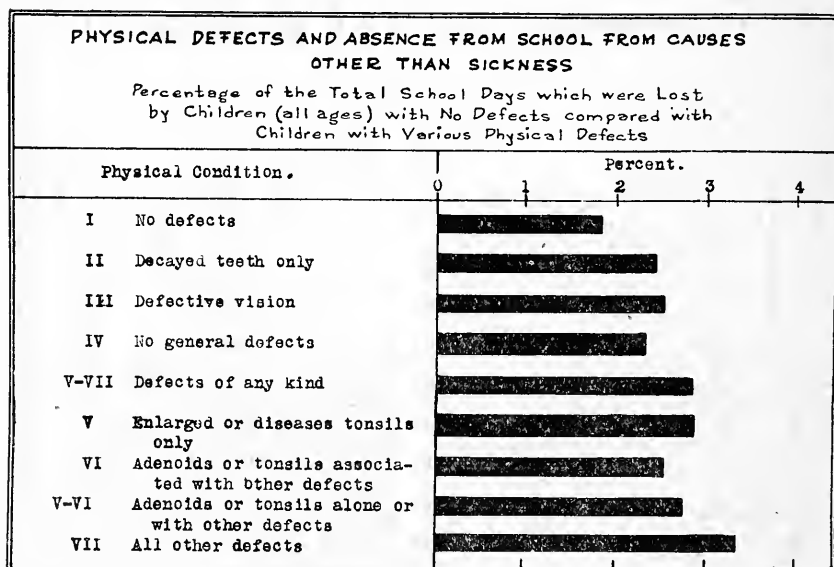


Fig. 3.

See Table III for detailed definitions of groups.

TABLE VII.—Physical defects and absence from school from causes other than sickness. Percentage of total school days which were lost by children with no defects compared with children with various physical defects.

[3,786 children in Missouri—School session 1920-21.]

Physical condition.	Age.					
	All ages.	6-7	8-9	10-11	12-13	14-16
BOTH SEXES.						
All physical conditions.....	2.5	2.9	2.1	1.9	2.6	3.6
Group I: No recorded defects.....	1.8	1.5	1.7	1.6	1.8	3.0
Group II: One or more decayed teeth only.....	2.4	3.0	2.0	1.7	2.3	4.1
Group III: Defective vision.....	2.5	4.1	2.5	1.8	1.8	2.5
Group IV: With and without defective teeth or vision but with no other defects.....	2.3	2.6	2.0	1.7	2.5	3.4
Groups V-VII: Defects of any kind.....	2.8	3.4	2.2	2.3	2.7	4.2
Group V: Enlarged or diseased tonsils only.....	2.8	3.5	2.3	2.1	2.6	4.9
Group VI: Adenoids alone and adenoids, tonsils, etc., associated with other defects.....	2.5	3.2	1.6	2.2	2.7	3.6
Groups V-VI: Adenoids, tonsils, etc., alone or associated with other defects.....	2.7	3.3	2.0	2.2	2.7	4.4
Group VII: All other defects.....	3.3	3.5	3.9	2.9	3.0	3.5

TABLE VII.—*Physical defects and absence from school from causes other than sickness—Con.*

Percentage of total school days which were lost by children with no defects compared with children with various physical defects.

Physical condition.	Age.					
	All ages.	6-7	8-9	10-11	12-13	14-16
BOYS.						
All physical conditions.....	2.7	3.3	2.2	2.1	2.7	4.1
Group I: No recorded defects.....	1.9	1.8	1.5	1.6	1.9	3.3
Group II: One or more decayed teeth only.....	2.5	3.0	1.8	1.8	2.4	4.5
Group III: Defective vision.....	2.9	4.0	3.6	1.9	1.9	2.7
Group IV: With and without defective teeth or vision but with no other defects.....	2.5	2.9	2.1	1.8	2.5	3.7
Groups V-VII: Defects of any kind.....	3.1	3.9	2.5	2.4	3.0	5.0
Group V: Enlarged or diseased tonsils only.....	3.3	4.2	2.7	2.2	3.2	6.2
Group VI: Adenoids alone and adenoids, tonsils, etc., associated with other defects.....	2.6	3.9	1.4	2.4	2.5	4.0
Groups V-VI: Adenoids, tonsils, etc., alone or associated with other defects.....	3.0	4.0	2.1	2.3	2.8	5.3
Group VII: All other defects.....	3.8	3.2	5.0	3.4	4.0	3.4
GIRLS.						
All physical conditions.....	2.2	2.5	1.9	1.8	2.4	3.1
Group I: No recorded defects.....	1.7	1.1	1.8	1.5	1.8	2.8
Group II: One or more decayed teeth only.....	2.4	3.0	2.2	1.6	2.2	3.5
Group III: Defective vision.....	2.3	4.2	1.6	1.7	1.8	2.4
Group IV: With and without defective teeth or vision but with no other defects.....	2.1	2.3	1.9	1.7	2.4	2.9
Groups V-VII: Defects of any kind.....	2.4	2.8	2.0	2.1	2.5	3.5
Group V: Enlarged or diseased tonsils only.....	2.4	2.9	2.0	2.1	2.2	3.6
Group VI: Adenoids alone and adenoids, tonsils, etc., associated with other defects.....	2.4	2.4	1.9	2.0	3.1	3.2
Groups V-VI: Adenoids, tonsils, etc., alone or associated with other defects.....	2.4	2.7	1.9	2.0	2.5	3.4
Group VII: All other defects.....	2.8	4.0	2.5	2.4	2.1	3.6

See Table III for detailed definitions of groups.

For some reason, absence from causes other than sickness also varies in the different physical-condition groups. Those groups with defects were absent more than the group with no defects. Part of this difference may be due to incorrect reporting of the causes of absence, but it seems unlikely that it could all be due to such causes.

#### Summary.

1. Records of physical examination and school attendance during the school session 1920-21 were kept for 3,786 children in four fairly representative localities in Missouri.

2. These children were classified according to physical condition, and the absences from sickness and from causes other than sickness were compared by age groups for children of different physical conditions.

3. Children with no defects were absent from school on account of sickness consistently less than those with defects.

Children with enlarged or diseased tonsils were absent more than children with no defects, and those with enlarged or diseased adenoids

or tonsils associated with other defects were absent considerably more than those with enlarged or diseased tonsils only.

Decayed teeth showed little or no effect on absence, and defective vision failed to show a consistent effect on absence from school on account of sickness.

4. Absence from causes other than sickness showed variations somewhat similar to absence from sickness; the groups with defects were absent more than the group with no defects.

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